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Changing consumption and production patterns

Report of the Secretary-General

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INTRODUCTION

1. The present report describes progress made in the implementation of the objectives set out in chapter 4 of Agenda 21 (Changing consumption patterns), 1/ with special reference to the relevant recommendations made by the Commission on Sustainable Development at its second session. 2/ The report was prepared by the Department for Policy Coordination and Sustainable Development as task manager for chapter 4 of Agenda 21, in accordance with arrangements agreed by the Inter-Agency Committee on Sustainable Development at its fourth session. It is the result of consultation and information exchange between designated focal points in United Nations agencies, governmental officials and a number of other institutions and individuals. Moreover, the report benefited from a number of intersessional meetings, especially the Oslo Ministerial Roundtable Conference on Sustainable Production and Consumption (6-10 February 1995), the Zeist Workshop on Facilities for a Sustainable Household (23-25 January 1995), and Massachusetts Institute of Technology/OECD Experts Seminar on Sustainable Consumption and Production Patterns (Cambridge, 18-20 December 1994).

2. The report starts with a general overview to identify the environmental, social and economic impact of present production and consumption patterns with a view to assisting Governments in establishing national priorities, followed by a summary of the results of recent projections and perspective studies. The relevance of data and information collection for monitoring, evaluating and reviewing performance is addressed next. An analysis of policy measures aimed at promoting sustainable production and consumption patterns follows, with a focus on the use of economic instruments. Finally, the report reviews progress by Governments, major groups and international organizations in implementing the Commission's decision. The document concludes by presenting proposals for a multi-year work programme for consideration by the Commission.

I. GENERAL OVERVIEW

A. Context

3. Policy measures which are directed at changing consumption and production patterns can have major impacts on many of the economic, social and environmental objectives of sustainable development. Such measures are designed to focus primarily on the microeconomic determinants of the behaviour of economic agents acting as producers and consumers. Other types of policies are needed for promoting economic growth and trade, changing demographic behaviour, developing human resources, alleviating poverty, promoting the transfer to developing countries of environmentally sound technology and financial resources, and managing natural resources. Policies in all of these areas and more need to be designed and implemented to achieve sustainable development.

4. A focus on changing consumption and production patterns is especially useful for integrating environmental and economic factors, for focusing on the demand side as well as the supply side of the economy, and for highlighting the need for policy measures that affect the behaviour of a large number of economic agents. Important for changing behaviour are measures which internalize

environmental costs to the economic agents responsible for them. But these need to be accompanied by measures which facilitate or magnify the responses of economic agents. Thus, a list of policy options might include: regulatory instruments, economic incentives and disincentives, social incentives and disincentives, facilities and infrastructure, information and education, and technology development and diffusion.

5. As a practical matter, many organizations and groups working in this area focus more narrowly or use a somewhat different organizing principle. Thus, the 1995 Oslo Ministerial Roundtable Conference on Sustainable Production and Consumption placed its main focus on the end-use of goods and services. Similarly, the Organisation for Economic Cooperation and Development (OECD) emphasizes the value-added that can be obtained from a new focus on the management of consumption (demand side) as a complement to existing work on production (supply side). The United Nations Environment Programme (UNEP), on the other hand, has a major programme for promoting cleaner production on a worldwide basis. The Netherlands, Norway and Germany have major programmes on product-oriented environmental policy which is built around the life-cycle approach. It utilizes policy instruments addressed to economic agents involved at each stage of the product cycle, from extraction, production and distribution to final use and disposal. The approaches mentioned above are all complementary, and the discussion in the report on policies draws on all of them.

B. The environmental, social and economic impact of present production and consumption patterns

1. Integrated life-cycle approach

6. Patterns of production and consumption are driven by final demand, competition, innovation and financial flows. Final demand, in turn, is driven by the purchasing choices of individuals, businesses and public sector entities which themselves depend on such factors as basic human needs, tastes (influenced by advertising), per capita income and wealth, and relative prices. Meeting these consumption demands sets in motion a flow of materials and products, generating in the process wastes and by-products harmful to the environment and to human health. The process of waste generation and environmental degradation - from extraction of raw materials to final consumption and disposal - is complex.

7. Most products consumed by end-users involve varying degrees of processing. The framework outlined in table 1 is a highly simplified version of what should otherwise be a complicated diagrammatic presentation of material flows and their environmental and socio-economic impacts.

Table 1. Product life-cycle approach

Stage	Environmental effects	Socio-economic impact
Extraction of raw materials	Land degradation, water contamination and deforestation/loss of habitat through mining, generation of extraction wastes and release of toxic chemicals	Loss of land titles, loss of revenues, marginal farming, food insecurity, exposure to health hazards
Processing, manufacturing; agricultural production	Air pollution, water contamination and land degradation caused by emissions, hazardous wastes, and toxic chemicals; soil erosion, sedimentation, salinity and water contamination caused by farming and agro-chemicals	Declines in factor productivity, efficiency losses, and exposure to health hazards
Distribution, consumption and disposal	Air pollution (including indoor), water pollution caused by air pollutants, municipal wastes and sewage	Loss of labour productivity, exposure to health hazards, and wasteful consumption habits/lifestyles

Source: Adapted from Environmental Trends, Washington, D.C., Council on Environmental Quality, 1989).

8. Several features are worth noting. First, the framework indicates that resource production and consumption is a multistage process, with each stage associated with certain types of environmental degradation. An immediate corollary of this integrated life-cycle approach is that each stage should be regarded as an integral part of a whole interrelated process, with changes at one stage yielding effects at other stages. For instance, establishing manufacturers' responsibility for some aspects of disposal at the end of product life cycles may influence design of the product and packaging material, thus integrating waste avoidance into the production process.

9. Secondly, by setting out the stages of resource production and consumption, the framework also provides the necessary structure for taking a closer look at the associated environmental, social and economic effects. In some instances, the environmental impact at the relevant stages may be quantified. For example, it was estimated that in the late 1970s the United States generated approximately 2,500 million tons of wastes per year in the extraction of raw materials, 250 million tons of industrial wastes in the processing and manufacturing of products, and 190 million tons of municipal wastes and sewerage in final consumption. 3/ A decade later, a more recent estimate suggests that in the late 1980s, the municipal wastes generated in the United States rose to

208 million tons per year, averaging 864 kilograms per capita, whereas industrial wastes increased to 760 million tons (see table 2). 4/

10. The present data on the amounts of wastes generated in OECD countries in the late 1980s, shown in table 2, reveal large variations among them. Such variations cannot be accounted for merely by the differences in the level or structure of industrial production and consumption. As far as production is concerned, the use of input and materials (intense or otherwise) and the adoption of technologies (i.e., whether they are environmentally sound or not) may well determine both the level of industrial waste generation and the chemical and physical properties of products, with implications for the use and disposal stages. As regards consumption, recent experiences in waste separation at the household level show that waste separation by households helps significantly to reduce municipal waste and decrease the need for new landfills or incinerators.

Table 2. Municipal and industrial wastes generated in OECD countries, late 1980s

Country	Municipal waste		Industrial waste	
	Thousands of tons	Per capita (kilograms)	Thousands of tons	Per unit of GDP a/
Canada	16 400	632	61 000	155
United States of America	208 800	864	760 000	186
Japan	48 300	394	312 300	235
Australia	10 000	681	20 000	146
New Zealand	2 110	662	300	15
Austria	1 730	228	13 260	211
Belgium	3 080	313	8 000	104
Denmark	2 400	469	2 400	41
Finland	3 000	608	12 700	221
France	17 000	304	50 000	89
Germany, Fed. Rep. of	20 230	331	61 400	95
Greece	3 150	314	4 300	123
Ireland	1 100	311	1 580	87
Italy	17 300	301	43 700	94
Netherlands	6 900	467	6 690	50
Norway	2 000	475	2 190	35
Portugal	2 350	231	6 620	292
Spain	12 550	322	5 110	27
Sweden	2 650	317	4 000	37
Switzerland	2 850	427	..	..
United Kingdom b/	17 700	353	50 000	146
Total	420 000	513	1 430 000	146

Source: Environmental Indicators (Paris, OECD, 1991).

a/ Tons per $10 million.

b/ England and Wales only.

2. Trends and issues in resource consumption and production

11. Within the framework outlined above, we proceed to examine some specific material groups. Bearing in mind the sectoral clusters to be addressed by the Commission at its third session, these included not only food and agricultural products and forest products but also energy and metals and minerals.

Energy 5/

12. Since the Industrial Revolution, economic activity has become increasingly dependent on energy use. Commercial demand for energy grew rapidly during the 1950s, registering an average annual growth rate of 4.9 per cent. It accelerated to 5.6 per cent in the 1960s, slowing down to 3.5 per cent in the 1970s, reflecting the dampening effect on demand of oil price increases. The 1980s witnessed a continuing slow-down in the growth rate, averaging 2.0 per cent annually. World wide, commercial energy supply accounted for about 88 per cent of total consumption, although more than 2 billion people in developing countries depend on non-commercial fuels (basically fuelwood and agricultural residues). 6/

13. In terms of economic groupings, the share of the industrialized countries of fossil fuel consumption (the principal sources of commercial supply) declined to less than 50 per cent of the world total between 1961 and 1990. This was accompanied by a dramatic fourfold increase in developing countries and substantial increase in the former centrally planned economies (by a factor of 2.4). 7/ In per capita terms, the absolute consumption of fossil fuels in developed countries outstripped by a factor of 9 the consumption level in developing countries, as is evident in table 3.

Table 3. Fossil fuel consumption

(Gigajoules/person)

	1961-1965	1966-1970	1971-1975	1976-1980	1981-1985	1986-1990
Industrialized countries	115.82	142.53	165.70	169.52	153.81	160.06
Developing countries	7.37	8.26	10.34	12.91	14.53	17.28

Source: World Resources, 1994-95 (Washington, D.C., World Resources Institute, 1994).

14. From the standpoint of the flow of resources, production and consumption of fossil fuels give rise to a wide range of environmental degradation. In the extraction stage, large quantities of solid and hazardous wastes are generated and released into the environment, requiring large tracts of land for disposal. Surface mining may disturb or destroy natural habitats. Acid mine drainage may

contaminate surface and ground water and reduce or eliminate aquatic life in surface-water streams. In the processing and refining phase, environmental damage may occur as a result of treatment and refining operations. Fossil fuel consumption in electricity generation and vehicle transport are associated with air pollution and the emission of greenhouse gases, including the generation of residuals like carbon monoxide (CO), nitrogen oxides (NO_x), sulfur oxides (SO_x), sulfur dioxide (SO_2) and total suspended particulates (TSP). It was estimated that in 1990 world wide 99 million tons of sulfur oxides (SO_x), 68 million tons of nitrogen oxides, 57 million tons of suspended particulate matter and 177 million tons of carbon monoxide were released into the atmosphere as a result of human activities. The OECD countries accounted for about 40 per cent of the SO_x, 52 per cent of the NO_x, 71 per cent of the CO and 23 per cent of the suspended particulate matter. 8/ In developing countries, added to these effects are the indoor air pollution problems caused by dependence on biomass fuels as energy sources. Women and children are particularly vulnerable to the health hazards posed by severe indoor air pollution.

15. Despite encouraging progress achieved over the past two decades in energy efficiency, especially in industrialized countries, global demand for commercial energy is projected to continue to grow in the coming years, with the main momentum coming from developing countries. One conservative estimate by the Department of Economic and Social Information and Policy Analysis of the United Nations Secretariat suggests that between 1990 and 2010 world energy consumption is expected to grow by 42 per cent, or an average annual rate of 1.8 per cent. About two thirds of the incremental energy demand is likely to occur in developing countries. 9/ Manufacturing, which consumes a large share of commercial energy supply, grew by an average annual rate of 6.0 per cent in developing countries in the 1980s and is expected to grow threefold in the next 20 years. 10/ However, this seemingly relentless increase may also be partly attributed to widespread subsidies. It was estimated that world wide, subsidies for electricity and fossil fuels, excluding the former Soviet Union, totalled $106 billion in 1991. 11/ These subsidies artificially lowered energy prices, leading to inefficient and excessive consumption, with attendant effects on emissions of pollutants and greenhouse gases. The World Bank further estimated that removal of world energy subsidies would lead to a net reduction of 5 per cent in global emissions of carbon dioxide. In developing economies, energy subsidies also disproportionately benefit the well-to-do who consume far larger amounts of energy than the poor.

16. Energy consumption by the transport sector - mainly road transport - is a major environmental concern. Some estimates suggest that road vehicles consume as much as half of the world's oil production. World wide, some 10 million cars and 5 million buses and trucks are added to the world vehicle fleet every year. About 80 per cent of the global car population is located in the industrialized world. Although in absolute terms most of the vehicle growth has occurred in industrialized countries, many developing countries are experiencing high growth rates in vehicle numbers.

17. Despite gains in fuel efficiency achieved since the 1970s, transport's share of total world oil consumption has continued to increase as a result of growth in the vehicle fleet and in the traffic volume. This has translated into mounting environmental degradation. Emissions from transport represent an

increasing share of overall emissions caused by human activities. In OECD countries, 70-90 per cent of carbon monoxide (CO) emissions originate from transport, mainly motor vehicles. The transport sector also accounts for 40-70 per cent of nitrogen oxide (NO_x) emissions. At least 50 per cent of atmospheric lead emissions originate from automobiles. 12/ When these and other emissions are concentrated at a local level, often in congested urban areas, they give rise to serious health hazards, as witnessed routinely in many large cities in both developed and developing countries. While measures like improved vehicle characteristics, better urban planning and traffic regulation have proved successful in reducing the amount of harmful emissions, sustained changes will have to come from user/consumer behaviour. Increasing use of public transport and car-pooling, for example, are some of the measures now being pursued in some countries to bring about long-run improvements in ambient air quality and hence the quality of life. In most cases social and economic instruments have been applied to catalyze and accelerate such behavioural changes (see sect. E below).

Metals and minerals

18. The past three decades have witnessed consumption trends of metals and minerals similar to those of energy. One estimate suggested that between 1961 and 1990 world consumption of primary aluminum, copper ore, lead ore, manganese ore, nickel ore, phosphate rock, crude steel, tin ore, and zinc ore rose by 120 per cent, or 2.7 per cent per year. Increases were most marked in low-income economies, where consumption grew by 360 per cent during the same period to meet demands of manufacturing industries. However, in the 1980s, annual growth rates of consumption for the world as a whole slowed to 1.5 per cent. 13/

19. The same period also witnessed a similar growth in the share of developing economies in the world total consumption of metals and minerals. As a group, the share of developing economies rose from 37.9 per cent in 1961 to 52.1 per cent in 1990. During the same period, consumption by industrialized countries fell from 58.7 per cent to 43.6 per cent, although on a per capita basis consumption in low-income economies remained small in comparison with the level in industrialized countries. 14/ A significant phenomenon observed during this period was the decline in the intensity of metal use in industrialized countries, pointing to the impact on demand of long-term trends in technological innovations, material substitution and in reuse and recycling of materials. For example, technological progress has made it possible to make thinner metal beverage and food containers (mainly aluminum and tinplate). In the area of material substitution, plastics, ceramics, and composites have increasingly been used in automobile manufacturing to produce lighter and more fuel-efficient cars. 15/ As regards reuse and recycling, one recent report by UNCTAD suggests that the recycling rate for most important industrial commodities, including aluminum, copper, nickel, lead, tin, and zinc varies between 25 and 50 per cent for developed countries and 2 and 40 per cent for developing countries. Improving product design and material substitution are likely to reduce further the intensity of metal use. This pattern also raises the question of how the relevant technologies can be adapted and introduced on a wider basis, benefiting those developing countries in the course of modernizing their manufacturing industries.

20. The environmental effects of the production and consumption of metals and minerals can also be identified by using the analytical framework outlined above. These effects are similar to those related to the mining and processing of fossil fuels (though not at the consumption stage). In the extraction stage, in addition to large quantities of solid waste, mining operations can cause land degradation and freshwater pollution, through the accumulation of toxic trace metals in soil and discharge into streams. Air pollution may result from smelting and refining operations. Since extraction and refining operations may often take place in areas inhabited mainly by the poorer members of the population, these members make up the principal victims of any local environmental degradation. Experiences in some Latin American countries show that the potential income-earning opportunities presented by mining operations may simply not be adequate to compensate for the damage to the local ecosystems. Even when mining operations end, in most cases the environmental damage is likely to endure. This raises the issue of how natural resources should be valued and how enterprise accounts should be compiled so as to reflect not just private costs incurred but also external environmental costs. (On the issue of internalization of external environmental costs, see sect. E below).

Food and agricultural products

21. World wide, gross agricultural production grew by an average annual rate of 2.3 per cent during 1970 and 1990. Domestic demand increased at the same rate during the same period. As a group, developing countries increased production by 3.3 per cent per annum, while the annual growth rate in developed countries was lower, 1.5 per cent. However, at 3.6 per cent per annum, demand in developing countries grew faster than production, implying net imports over these years. With the exception of sub-Saharan Africa, production growth in per capita terms in developing countries remained positive during the period and is expected to be so in the coming years. 16/

22. Per capita food supply for direct human consumption registered similar growth rates, but with considerable variations among developing countries (see table 4). While East Asia increased per capita food supplies from 2,020 calories per day in 1969-1971 to 2,600 in 1988-1990, per capita calorie consumption in sub-Saharan Africa stagnated. As a result, the number of undernourished people in the region rose from 94 million in 1969-1971 to 175 million in 1988-1990. In contrast, significant reductions in the incidence of undernutrition were achieved in East Asia during the same period. For developing countries as a group, the number of undernourished people fell from 941 million to 781 million, and the share of population suffering chronic undernutrition declined from 36 per cent to 20 per cent.

Table 4. Food supply for direct human consumption

	Per capita food supply (calories/day)		Chronic undernutrition			
			Percentage of population		Number of persons (millions)	
	1969-1971	1988-1990	1969-1971	1988-1990	1969-1971	1988-1990
93 developing countries	2 120	2 470	36	20	941	781
Africa, sub-Saharan	2 140	2 100	35	37	94	175
Near East/ North Africa	2 380	3 010	24	8	42	24
East Asia	2 020	2 600	44	16	497	252
South Asia	2 040	2 220	34	24	254	271
Latin America and the Caribbean	2 500	2 690	19	13	54	59
Developed countries	3 140	3 410				

Source: FAO, "Agriculture: towards 2010" (C 93/24).

23. This overall progress notwithstanding, considerable gaps in food consumption remain between developing and developed countries, as can be seen from tables 4 and 5. The consumption gap in protein is even wider. For instance, while per capita consumption of beef and veal increased in both industrialized and developing countries over the past three decades, the consumption level in the former was approximately six times as high as in the latter. The increasing demand for meat and other livestock products has led to a wide range of environmental degradation associated with livestock raising and processing. Overgrazing contributes to soil degradation and desertification. In some industrialized countries, mechanized livestock farming has caused enormous manure disposal and water pollution problems. In developing countries, chemicals used in processing hides are often released into the air, freshwater streams, lakes, rivers and coastal areas, causing pollution and environmental degradation.

Table 5. Beef and veal consumption
(kilograms/person)

	1961-1965	1966-1970	1971-1975	1976-1980	1981-1985	1986-1990
Industrialized countries	24.53	27.37	28.59	29.65	27.69	27.17
Developing countries	3.98	4.06	3.84	4.21	4.05	4.29

Source: World Resources, 1994-95 (Washington, D.C., World Resources Institute, 1994).

24. While direct human consumption of cereals and other major crops leads to few environmental effects, the production stage has generated pressure - in many instances, severe pressure - on ecosystems. The increasing application of chemical fertilizers and pesticides has contaminated land and surface and ground water, and impaired human health. In some areas, agricultural fertilizers are among the principal sources of eutrophication of surface water and nitrate contamination of ground water. Among the harmful effects of pesticide use are threats to human health and reproductive capacity; development of pest resistance and the accumulation of chemicals in food chains. Some estimates suggest that about 50 per cent of the fertilizers used are lost from the soil system by leaching, runoff, and volatilization, whereas more than 90 per cent of pesticides do not reach the target pests. 17/

25. World wide, consumption of chemical fertilizers more than doubled over the past two decades, rising from 69 million tons in 1970 to 146 million tons in 1990. Consumption increased by 360 per cent in developing countries, as compared with 61 per cent in developed countries. The same period also witnessed the share of developing countries in world fertilizer consumption rising from 20 per cent in 1970 to 43 per cent in 1990. But the intensity of use (application of fertilizers per hectare) has been much higher in developed countries. 18/ The use of pesticides, measured in terms of sales, grew from US$ 7,700 million in 1972 to US$ 25,000 million in 1990 (1985 dollars). Some 80 per cent of the pesticides are applied in developed countries, although their use is increasing faster in developing than in developed countries (7-8 per cent as against 2-4 per cent per year). 19/

26. Inappropriate farming and land management practices constitute another major source of pressure on agro-ecosystems. Overgrazing of rangeland, mining of soil nutrients and ground water, poor management of irrigation schemes and farming of marginal lands - practices observed mainly in developing countries - have caused or exacerbated soil erosion and land degradation. In many developed countries, agricultural subsidies have provided incentives for overproduction, leading to the expansion of environmentally damaging agricultural activities at both the extensive margin (e.g., deforestation and reclaiming wetlands) and

intensive margin (e.g., overuse of agrochemicals and irrigation water). 20/ World wide, about 295 million hectares of land are strongly degraded (defined as the large destruction of the original biotic functions of land), of which 75 million hectares have been damaged by overgrazing and 83 million by improper land management. Another 910 million hectares of agricultural land are estimated to be moderately degraded, facing declines in productivity. Unless effective action is undertaken to protect and conserve the fertility of this portion of the earth's agricultural land, it risks being irretrievably lost. 21/

27. An important issue in food and agricultural production concerns land titles and property rights. Recent experiences have demonstrated that farmers' behaviour in land management is more environmentally friendly when they have well defined and secure titles to land. They are more willing to invest in soil fertility and water-efficient irrigation projects. When realized, the resulting increases in yields and harvest should also generate more income to farmers, assisting in food security and poverty alleviation.

Forest products

28. Forests are widely recognized as a highly concentrated and yet diverse source of the earth's natural wealth. They supply a wide variety of products, ranging from fuelwood for local inhabitants to commodities such as timber and rubber. The commercial value of forest products has been one of the driving forces behind the rapid destruction of tropical rain forests, disrupting the regenerative process of the earth in many locations. (Clearing the forest for crop and range land has been widely recognized as the other principal source of pressure on the forest.) The loss of biodiversity and the erosion in the services provided by forests - stabilizing topsoil, acting as watersheds, supplying fuel for local populations - are often the consequences of unrestrained logging for timber or clearing the forest for agricultural and livestock production.

29. World wide, the past three decades witnessed a doubling of the consumption of roundwood, a major forest product for commercial consumption. While the share of developing countries in total consumption increased, in per capita terms the level of consumption in industrialized countries continued to exceed the level in developing countries by a factor of approximately 2.5 (see table 6). The same pattern of consumption is observed in paper, another major forest product. While per capita consumption of paper averaged 45 kg world wide in 1990, the amount consumed in developed countries (150 kg) outstripped by far the amount in developing countries (10 kg). 22/

Table 6. Roundwood consumption
(Cubic metres/person)

	1961-1965	1966-1970	1971-1975	1976-1980	1981-1985	1986-1990
Industrialized countries	1.10	1.60	1.14	1.17	1.17	1.29
Developing countries	0.43	0.44	0.44	0.46	0.48	0.48

Source: World Resources, 1994-95 (Washington, D.C., World Resources Institute, 1994).

30. The consumption of forest resources, when not managed according to sustainability criteria, results in irretrievable loss of habitats and biological resources. Clearing forest for fuelwood and agricultural production and logging for timber has led to widespread deforestation and devegetation. Estimates of forest resources in the tropical regions suggest that in the three developing regions of Africa, Asia and Latin America and the Caribbean, a total of 16.9 million hectares of forest area was lost during 1981-1990. In many instances, policy failures have aggravated the situation. A typical example is the undervaluation of forest resources. In some cases, rents charged for logging are set well below the full value of forest resources, allowing loggers to reap super-normal profits, and spurring excessive logging. In sub-Saharan Africa and other tropical areas, clearing the forest for fuelwood and food production has been caused by a high incidence of poverty. One study suggested that in sub-Saharan Africa landless farmers are responsible for three fifths of the rain forest lost annually. 23/ But the loss of soil fertility and land degradation that may soon occur in the wake of the clearing of the forest often undermine the very fragile base for the survival of the poor, thereby perpetuating a vicious circle.

C. Projections and perspective studies

31. Given existing physical infrastructure and lifestyles, achieving sustainable consumption and production patterns may take years or decades. To understand the dynamic interactions between human activities and environmental changes over the long term, the Commission at its second session also called on Governments to undertake projections and perspective studies so as to better appreciate the consequences of present policy stances on resource consumption and production and the possible impact of changing these policies. 24/ This section identifies some recent studies and describes their relevance to policy debate and formulation.

1. Studies at the international level

32. Projections and perspective studies at the international level are normally carried out by international organizations or academic institutions with the research funds and staff necessary for such studies. Typical examples include the long-range world population projections published by the United Nations which have long been the bench-mark studies in population dynamics, widely utilized in forecasts. Other studies, such as commodity outlooks prepared by the World Bank and United Nations agencies, have also been used in policy analysis. Perspective studies on future energy demand and on changes in reserves have been the subject of research and projections by several international agencies and academic institutions, including the International Energy Agency. In the 1970s, inspired by the report of the Club of Rome and report of the Bruntland Commission, a number of world models were developed to integrate economic and environmental processes.

33. More recently, modelling efforts have begun to focus on climate change and ozone depletion. For instance, assessment reports by the Intergovernmental Panel on Climate Change have provided projections of climate change through the year 2030. The scenarios presented by the Panel reports - the business-as-usual and alternative scenarios - have provided important stimulus to intergovernmental debate and have become part of the information basis underlying some of the most far-reaching policy changes and outcomes in recent years, in particular those on the emissions of greenhouse gases and energy consumption. The World Model, pioneered by Nobel Laureate Wassily Leontief and maintained at the Institute for Economic Analysis at New York University and at the United Nations, uses input/output and trade data to develop scenarios for 17 world regions, exploring a number of environmental issues, including the volume of CO_2 emissions. The OECD General Equilibrium Environmental model (GREEN) represents another major attempt at analysing CO_2 emissions and climate change. Based on input/output and trade data from individual countries, the model allows for a large and flexible regional disaggregation, making it well-suited for analyses of international competitiveness issues and the simulation of different kinds of regional and global agreements on reducing CO_2 emissions. 25/

34. An important perspective study in agriculture is the report prepared by FAO, "Agriculture: towards 2010". 16/ The most significant feature of this study lies in its integrated approach to agricultural production and future food supply, the impacts on natural resources and the socio-economic dimensions, including food security and hunger alleviation.

2. Studies at the national level

35. Projections and perspective studies at the national level, including sectoral studies on energy and commodity consumption, are available for most developed and some developing countries. However, studies focusing on environmental, social and economic impacts of resource consumption and production are confined to a limited number of countries. These are often done in connection with national environmental plans or strategies, accompanied by specific targets for fulfilment. For example, the National Environmental Policy Plan of the Netherlands incorporated the results of various studies on climate

change and set the national CO_2 emissions targets through the year 2000, together with the outlines of policy measures necessary for achieving the objectives. Similar procedures have also been applied to waste control and prevention. In 1993, a second national environmental policy plan was adopted, which revised, updated and further improved the first. It also further strengthened the implementation framework and introduced more specific measures aimed at achieving sustainable patterns of production and consumption, including a renewed emphasis on the flow of information between government, industry and consumers. 26/

36. Similar experiences have taken place in many other countries. In Finland, a national report on a new energy strategy sets ambitious targets for the reduction of emissions in the energy sector. Through tightening standards and administrative measures, the Government seeks to achieve by the year 2000 an 80 per cent reduction in SO_x emissions from the 1980 level. The government also intends to stabilize CO_2 emissions and aims at stopping the CO_2 emissions growth by 2000. To achieve these targets, the Government has decided to adopt a new structure of energy taxation in 1994. Fossil fuels will be taxed, using a single carbon coefficient. In addition, a consistent tax rate proportional to the energy context will be fixed for all sources of primary energy except wood, wind power and waste.

37. In Canada, several provincial governments have also introduced specific targets in their strategies for future environmental protection. Alberta has adopted an Action on Waste programme directed at reducing the amount of municipal solid waste by 50 per cent by 2000. Manitoba has adopted a recycling programme aimed at recycling up to 75 per cent of household waste by 1996. At the federal government level, the Environmental Partners Fund, established under the Environmental Citizenship Initiative, has targeted part of its funding to assist community groups in carrying out composting and recycling projects.

D. Actions and efforts to intensify and expand data collection

38. The preceding assessment of the trends and issues in resource consumption and the impact on our environment and society suggests that while developing countries are catching up in resource consumption and are expected to experience higher growth rates in the coming decades, in per capita terms significant consumption gaps remain between developing and developed countries. Narrowing these gaps, while protecting our natural resource base and ecosystems, poses a key challenge to achieving sustainable production and consumption patterns.

39. There is a growing recognition that without the necessary data on the trends in the environment and ecosystems, policy-making is likely to be impaired. Environmental monitoring will be haphazard if not based on reliable information on the sources and processes of environmental degradation. Remedial measures, such as technological improvement on production methods and changes in product design, will be difficult to conceive. Consumers will be unable to differentiate between products and will not be able to appreciate the need for changes in consumption habits and lifestyles. Aware of the importance of meeting the information requirement, the Commission at its second session called

on Governments to intensify and expand their efforts to collect relevant data at the national and subnational levels.

40. Since UNCED, many Governments and international organizations have initiated or intensified their effort at compiling comprehensive environmental information and monitoring data, including those on the social and economic variables having close bearings on the status and changes of the environment. In general, these efforts proceed at three levels - environmental monitoring; environmental resource accounting; and sustainable development indicators (SDI). Following the latest effort at changing consumption patterns, such as those initiated by Norway, Denmark, Sweden and the Netherlands, among others, a new information need is emerging - consumer information. Such information is expected to cover product content, the environmental impact of the product, environmental impact of consumption habits and lifestyles. In countries where community and citizen groups have launched "green" consumer movements, there is also a growing recognition of the need to collect and disseminate feedback information so as to evaluate and demonstrate progress in environmental quality arising from changes in consumer behaviour.

1. Environmental monitoring

41. In general, environmental monitoring data refer to the data on the state of the environment (environmental quality) and the changes in the stock and flow of natural resources (resource quantity). Issued annually, they may cover air, freshwater, land, forest, wild life, raw materials (metals and minerals), energy, manufacturing and agricultural sectors. They serve to inform the nation of the changes and trends in the quality of their national environment and ecosystems and resource flows. In most developed countries, data on waste generation and expenditure on pollution control are also available. Often included are relevant economic and social data, such as population, urbanization, and GDP growth. Because of their early head start in this effort, the OECD countries have generally comprehensive data on these environmental and related variables. OECD publications like State of the Environment in OECD Member Countries and Environmental Data Compendium provide data and information on new developments in the national environment. In the United Nations system, the Environmental Data Report, coordinated and published by UNEP, is a most comprehensive regular publication on the monitoring and assessment of the state and trends of the global environment. Comprehensive national monitoring data are not yet available in many developing countries, although some sectoral data based on survey results have been published and made use of in policy discussion and formulation.

42. Monitoring data, especially those on emissions and wastes, are of particular relevance to changing production and consumption patterns, since they generally identify the sources of emissions and wastes. For instance, emission data not only include amounts of specific pollutants but also relate them to sources (stationary, which include power stations; mobile, which include motor vehicles; and industrial processes, basically manufacturing). Data on waste generated are given by sources and sectors, together with the amounts. Using the integrated life-cycle approach, one may design and formulate emission/waste reduction policies in light of their sources and stages.

43. In recent years, environmental monitoring has evolved to extend to environmental impact assessment (EIA). 27/ In some countries, large-scale development projects are subjected to comprehensive EIA studies before clearance is obtained. Increasingly, projects financed or supported by international funding and development agencies are going through the same screening procedure. Given the weight of extracting/mining industries and the manufacturing sector in industrial waste generation, some countries are also developing and applying environmental audits to monitor the behaviour of corporations and businesses in the protection of the environment and ecosystems. These are divided into three types: compliance audits aimed at reviewing permits and environmental management system; transaction audits conducted to determine environmental liabilities; and production process audits used to evaluate the technical structure of a plant and to recommend operational changes to improve the efficiency of using natural resource inputs, reduce waste and prevent pollution. 28/ Increasingly, businesses are applying environmental audits on a voluntary basis, reflecting progress in environmental awareness and its impact on economic activities.

2. Environmental resource accounting

44. Environmental resource accounting, often referred to as "green accounting", stems from the failure of conventional systems of national accounts to take into consideration the services rendered by environmental resources (such as the sink function of forests), their depletion and the damages to the national ecosystems. Efforts at resource accounting also reflect the need to give economic or monetary value to resources and ecosystems that have until recently been regarded as free goods (such as the free use of water and land for the release of toxic chemicals and waste disposal). It has been argued that this underpricing of resources has contributed to the wasteful and inefficient production and consumption of resources, and there is a need to move towards full-cost pricing of such resources through economic instruments (like taxation and imposition of user charges). In this sense, environmental resource accounting is a necessary precondition for full-cost resource pricing. 29/

45. There are a number of techniques of economic valuation of environmental and natural resources. Among the ones that have received most attention are the Hedonic Price Methods (HPM), which estimate an implicit price for environmental attributes by looking at real markets in which those attributes are effectively traded; Travel Cost Method (TCM), which uses the information on the money and time that consumers spend on enjoying a recreational site as a proxy for the demand for that site; and the Contingent Valuation Method (CVM), which derives the value of environmental resources by considering the willingness of consumers to pay to guarantee an improvement in the quality of the environment or willingness to accept compensation to forgo this improvement. 30/ While the development of such methods has helped fill in the knowledge gap in full valuation of environmental and natural resources, there remain considerable difficulties in their application for policy purposes. Currently, UNEP is implementing a work programme on resource valuation. Under preparation are a manual and training materials on the use of the above valuation methods, with particular emphasis on valuing services and damages incurred through the use of

environmental assets, including transboundary externalities and non-market services.

46. Despite the technical difficulties and methodological imperfections, a number of countries have tried to incorporate the stocks and flows of natural and environmental resources as well as environmental damages into national accounts to achieve a more realistic and balanced measure of real sustained growth and welfare (the Netherlands, Norway, the United States). At the international level, the Statistical Division of the United Nations Secretariat, in collaboration with UNEP and UNDP, is currently assisting three developing countries (Indonesia, Colombia and Ghana) in the application of techniques of integrated environmental and economic accounting. The Division is also coordinating an attempt to reach international agreement on national reporting systems that will integrate environmental statistics with the established system for economic and social accounting. It and the collaborating agencies stress the need to develop national databases that integrate environmental and socioeconomic data as a prerequisite for integrating accounting and policy analysis. 31/

3. Sustainable development indicators

47. Parallel to the activities in the collection of monitoring data and resource accounting is the compilation of sustainable development indicators, guided and coordinated by the Commission itself at the intergovernmental level. At the national level, an increasing number of Governments have already compiled basic elements to be incorporated into an agreed framework for internationally comparable sustainable development indicators. Some Governments also took the step of incorporating these elements in their national reports to the Commission at its second session. It is now generally agreed that the indicators should fill the gap in environmental information and reflect the interactions and interrelationships between environmental and social economic dynamics. They should be used to measure progress in sustainable development and identify policy issues and shortcomings. See the report of the Secretary-General on information for decision-making and Earth Watch for a detailed discussion of work in this area. 32/

4. Consumer information and behavioural changes

48. Traditionally, consumer information has been compiled for the purpose of consumer protection. In 1985, the General Assembly adopted Guidelines for Consumer Protection, 33/ which have since been widely used by Governments to develop legislation and policies in areas encompassing safety, standards, education and information programmes and measures relating to food, water, chemicals, product quality control, international labelling and cooperative mechanisms. In spite of these efforts, the need for changing the present unsustainable consumption patterns has spawned new information requirements. Recent experiences at promoting sustainable consumption in a number of developed countries suggest that despite growing environmental awareness, the majority of consumers still have little knowledge of the environmental impact of their consumption habits and lifestyles. While an ever large number of consumers

express their readiness to purchase environmentally friendly products, even paying a "green" premium, they may be unable to tell which producers make environmentally friendly products (with, for example, no environmentally hazardous substances) or where to find them. They also have limited knowledge of the life-cycle effects of products (these should include the environmental impact arising from the extraction and processing of raw materials, manufacturing of products and their disposal at the end of their envisaged life). 34/

49. In response to this lacuna, an increasing number of Governments, in collaboration with manufacturers, standard and certification organizations, and consumer groups, have initiated eco-labeling schemes, covering a growing range of consumer products. In the Netherlands, the retail sector is playing an important role in helping disseminate product information and assisting consumers in purchase choices. There is enough evidence to conclude that there is a core group of consumers in the society committed to adopting new consumption values and lifestyles. If this group is provided with the necessary information, these consumers will take the lead in setting in motion sustainable consumption patterns and encourage broader participation from society at large. The recent emergence of eco-labeling schemes in developed countries, although aimed at increasing consumer knowledge and changing consumer behaviour, has caused a number of concerns in developing countries over production, trade and environmental protection. A key feature shared by most eco-labeling schemes is the requirement concerning the producer's use of raw materials and production processes because of the related environmental effects. Given the technological gap as well as different geographical and ecological conditions, producers in developing countries may often find these criteria difficult to comply with, in terms of both technological capacity and adverse effects on cost competitiveness. Also, in the absence of full consultation, the process of criteria-setting is such that producers in developing countries may not have the opportunity to participate, and the criteria finally adopted may correspond to conditions in developed countries only. Recent work carried out by UNCTAD and OECD suggests that increased transparency, the use of scientific data as a basis for developing the criteria, more attention to the specific environmental conditions of producer countries, transfer of environmentally sound technology, accurate and systematic life-cycle analysis, and participation of foreign producers in the development of the schemes are among the measures that could be employed to improve eco-labeling. For detailed discussions on the trade implications of eco-labeling schemes, see "Report on the Workshop on Eco-labelling and International Trade", prepared by UNCTAD. 35/

E. Design and implementation of measures aimed at sustainable consumption and production patterns

50. Analytical studies initiated by OECD as well as country experiences have revealed that Governments normally utilize several types of instruments to bring about changes in production and consumption patterns. These include legislation and standards (command-and-control measures), fiscal and pricing policies (economic instruments), education and awareness campaigns (social instruments), public expenditures on complementary facilities and infrastructure, and

technology policies. Often, these measures are pursued together to achieve enhanced effectiveness.

1. Command-and-control measures

51. Most countries responded to environmental degradation by first enacting new legislation, generally coupled with new technical standards and practices. In response to specific episodes of environmental degradation and also reflecting the early piecemeal approach, the enactment of these new laws often aimed at reducing specific pollutants or environmental damages, such as the Federal Water Pollution Control Act of 1948 and the Air Pollution Control Act of 1955 (United States). With growing public awareness and gains in knowledge of the scope and extent of environmental degradation, the single-solution approach gradually gave way to more comprehensive law-making endeavours to achieve overall improvements in environmental management. In many instances, these efforts are embodied in a comprehensive national environment policy act, covering resources protection, pollution prevention and control. Some countries have also passed laws prohibiting the use of selected inputs in certain categories of products, such as pesticide or toxic chemicals. It is now recognized that the application of these command-and-control measures over the past few decades has succeeded in halting some forms of environmental degradation, protecting species and changing producer behaviour. Not surprisingly, these command-and-control measures are generally targeted at producers in industry who are engaged in the upstream activities of extraction and processing of raw materials and manufacturing of intermediate and end products.

52. In many cases, national legislative actions are related to efforts at the international level, embodied in international treaties, conventions and agreements. These may apply to countries of specific economic groupings or geographical regions. In the past 20 years some 90 international legal instruments have been registered, a dramatic increase over the preceding period. These instruments cover natural resources, species, water, biodiversity, pollution prevention and hazardous wastes etc. The increase in the number of instruments and the areas covered attest to the transboundary nature of environmental problems, its attendant global dimensions and the need for international cooperation and coordination.

2. Social instruments: education and public awareness campaigns

53. The UNCED process provided strong momentum for the use of social instruments. These include information for consumers and community actions. The thrust of social instruments lies in the spontaneity, initiative, conviction and enthusiasm that are often associated with grass-roots movements. In some countries, Governments play an active role in supporting such movements by providing technical or financial support and by responding to campaign initiatives in actual deeds. To the extent that such movements or campaigns may help persuade producers and consumers alike to change course by reducing environmentally degrading practices and habits, they deserve to be given broad support by all segments of the society.

54. Governments themselves may often use social instruments. They may initiate their own action in areas like education and information to promote sustainable consumption values and lifestyles. They may provide or support facilities to catalyze and sustain consumers' behavioural changes - for example, by upgrading public transport, improving waste collection and recycling services, and establishing infrastructure for sustainable consumption. In countries like Norway and the Netherlands, among others, Governments also conduct direct negotiations with major stakeholders so that voluntary agreements could be concluded between parties concerned to meet specific environmental targets.

55. Education, both formal and informal, has a unique role to play in changing consumer attitudes and behaviour. Introducing formal environmental curricula into national education systems will go a long way towards enhancing environmental literacy and skills. For instance, children who are taught the importance of protecting the environment and the planet's ecosystems will grow up to become tomorrow's environmentally conscious managers, workers and environmentally friendly consumers. However, environmental education and awareness campaigns should go beyond the general public by, for example, developing targeted programmes of environmental education and training for corporate managers, production managers, engineers, designers, and the work force.

3. Economic instruments

Rationale of economic instruments

56. Many environmental problems arise because of externalities which arise from production and consumption in market economies. For instance, a power plant utilizes inputs and labour to generate electricity and in the process emits pollutants that cause air pollution, despite the fact that the plant's intended output is electricity rather than air pollutants. So long as the ecosystems still have the capacity to absorb the pollutants, such negative externalities have been ignored. This service of providing a "sink" has been rendered outside the market - that is, without any price attached to it. When it becomes clear that accumulated environmental effect caused by resource consumption and production have exceeded the absorption capacity of the ecosystems, externalities have to be internalized by polluters, hence the "polluter pays" principle. While such costs can be internalized by command-and-control measures and economic instruments, the latter are often far more efficient.

57. Inappropriate governmental policy may also give rise to undervaluation of resources and, hence, their overuse. In most cases, such policy failures not only encourage environmental degradation but also lead to economic inefficiencies. Among the main policy failures so far identified are low user charges on publicly owned natural resources (which encourage excessive logging or mining operations because of super-normal profits), and perverse subsidies (which lead to excessive levels of production and/or input use). 36/

58. Ideally, the application of an economic instrument should result in the equivalent of an optimal "Pigouvian tax" (tax that equates the marginal social benefit of reducing the externality to the marginal cost of achieving the

reduction). In practice, determining the optimal level of such taxes is impossible because of difficulties encountered in valuation and cost calculations. Experiences suggest, none the less, that although the amounts of taxes or charges may vary from country to country, they are often adjusted over time to move society closer to a pattern of production and consumption deemed better to reflect the full range of the costs, including the costs to the society and to future generations.

59. An important feature of economic instruments lies in their incentive effects on behavioural changes, in both manufacturers and consumers. For instance, emission charges create powerful incentives to reduce environmental degradation, since reductions in charges are commensurate with reductions in pollutants. This cost factor (as is the case with tradable permits) also stimulates manufacturers to search for cleaner technologies, thereby contributing to long-run changes in production processes. Indeed, the incentives effects on the behavioural changes of manufactures in face of the internalization of externalities have been generally established as positive. 37/ As for consumers, deposit/refund systems are clearly aimed at changing their consumption habits. By placing a refundable surcharge at sale points on those products that may have negative environmental effects if abused in their disposal, deposit refunds allow the consumer to either return the product (or its container) and get paid back the surcharge for avoiding environmental degradation, or forfeit the refund. As is seen below, the experience of those countries applying deposit/refund schemes indicate that there is a high percentage of return.

60. Basically, economic instruments include the following main types: charges/taxes on emissions (subdivided into air, noise, soil, waste, and water); charges/taxes on products; deposit/refund systems; tradable permits. As the discussion on the need for internalization of externalities above suggests, most of these instruments are intended to correct for market failures. However, there is a considerable number of cases where charges are related to services rendered, especially in the case of the collection and disposal of municipal waste. In an increasing number of developing countries and economies in transition, economic instruments are also being used to generate resources to fund national environmental protection programmes. 38/

Economic instruments in action

61. So far, economic instruments have been applied mainly in industrialized countries, although an increasing number of developing countries have started adopting them. For instance, charges on emissions are levied formally in OECD countries, mostly on sources of pollution, either in the form of a flat rate (as in the case of municipal waste) or in proportion to the actual amount of emissions. Experiences in Sweden, Canada and the United States have provided clear evidence of the effectiveness of emissions charges, as embodied in actual emissions reductions. The results in some other countries, such as in Japan, although considered positive, are less clear-cut, since actual reductions in emissions may have been due to other control efforts.

62. Product charges are levied either on products themselves or on product characteristics, such as carbon or sulphur content. A typical example is tax on

leaded car petrol. Records in most industrialized countries that have adopted a leaded petrol tax suggest that partly as a result of the differentiated taxation on leaded and unleaded petrol, the market share of unleaded petrol has increased, in some countries by a large margin (Germany, Finland, Netherlands and Switzerland). In the United States, total annual emissions of lead nation-wide declined from 203.8 million tons in 1970 to 8.1 million tons in 1987, mainly due to the gradual phasing out of leaded petrol. 39/ In Thailand, in 1991, a tax on leaded petrol was introduced to finance a subsidy for unleaded petrol. 40/ In some countries, products charges are also levied on fertilizers and pesticides, with the revenue thus generated channelled to environmental expenditure or general budgets (Austria, Finland, Norway, Sweden, United States). Consumption levels of nitrogen and phosphorus are estimated to have decreased in those countries. 41/

63. Likewise, deposit refunds have also achieved remarkable results on average, with return rates in some countries as high as 90-100 per cent (Norway, Sweden, Finland and the Netherlands). Similar results have been achieved with deposit refunds on beer and soft drinks, although return percentages for wine and liquor vary between 40-80 per cent. Since they generally operate at sale points through the retail channel, the deposit/refund systems have low administrative costs. Because of this advantage, some developing countries have already introduced them as an instrument for internalization of consumer-originated externalities. Since 1988, the Republic of Korea has operated a deposit/refund system on food containers, tires, batteries, lubricants, pesticide containers, and plastics. 42/

64. Of the main types of economic instruments, tradable permits is the only one that is directly related to the creation of a market where emissions permits could be traded between interested sellers and buyers. When regulatory authorities have determined the overall level of emissions permitted within a given area, permits equal to the total permissible level of emissions are distributed among polluting firms in that area. Firms that succeed in meeting their emissions obligations below their allotted levels may sell or lease their credits to plants of the same firm or other firms. 43/ Although empirical experiences of tradable permits are limited to a few countries, the records in the one country that has long practised tradable permits on a large scale - the United States - show that tradable permits are an effective means of air and water pollution control. Added to the effectiveness of this instrument is its cost advantage, since in economic terms, permits or allowance trading also assists in lowering costs at the firm level. 44/ An additional advantage is that tradable permits could encourage more technological innovations, since firms have an incentive to search for the best technologies and sell on the market whatever emissions reduction credits thus realized. The successful experiences in tradable permits also point to the importance of the simultaneous use of other instruments. In the case of tradable permits, command-and-control measures are also necessary, since regulatory authorities have to predefine the emissions ceilings.

65. The growing use of economic instruments and an assessment of obstacles to overcome for further progress, is examined in the report of the Secretary-General on financial resources and mechanisms for sustainable development. 38/

Table 7. Instruments for changing consumption and production patterns

Type of instrument	Functions	Advantages	Disadvantages
Command and control			
Legislation	To provide a legal framework for environmental protection To serve as guidelines for policy formulation at different levels	General compliance Higher certainty of agent's response and behaviour	Enforcement costs can be high Lack of flexibility
Standards	To set technical standards, including ambient and effluent standards	See above	The cost of compliance may be high for some industries in some countries
Quotas	To establish ceilings on pollutants, such as emission quotas, and on resource quotas like fishing/logging quotas	When traded among companies and market agents, have the cost advantage and flexibility of tradable permits	Local ambient quality could be affected
Economic instruments			
Establishing property rights and responsibilities	To provide incentives for environment-friendly behaviour	Combine development with environment protection	Difficult to implement in some sectors, such as land titles
Charges	See above By charging the cost for resource use, generate resources for cleaning-up and protection programmes	In addition to revenue creation, charges such as effluent charges, user charges and product charges help reduce material intensity and minimize waste	Universal charges may limit the growth potential and survival of small businesses
Deposit and refund	To provide incentives for recycling and reuse	Minimizing waste and reducing resource use	Lower deposits may not attain desired results
Differentiating taxation	To provide, mainly through price signals, incentives for consuming environment-friendly products and services To generate resources for environmental protection programmes	Tackles market failures through price adjustments so as to compensate for externalities Creates markets for environment-friendly products; stimulates research and innovation in environment-improving technology	In some cases administrative costs associated with tax collection and enforcement might be high

Type of instrument	Functions	Advantages	Disadvantages
Subsidies	To subsidize research and development in new technology	Helps alleviate constraints on private research and development budget allocations	May run counter to polluter-pays principle
Social instruments	To raise public awareness of environmental issues and foster changes in attitudes and behaviour	Helps mobilize political will and group pressure on producers as well as consumers	Sometimes may become difficult to sustain
	To introduce environmental education into education systems	Enhances knowledge and skills in sustainable production/consumption	

Source: Department for Policy Coordination and Sustainable Development, United Nations Secretariat.

4. Technology innovation and transfer

66. The application of command-and-control measures and of the social and economic instruments outlined above is expected to speed up the development and diffusion of technologies that pollute less and are more efficient in the use of inputs and raw materials. Some measures are, of course, aimed directly at producers, but even those aimed at consumers will have an effect on producers by altering conditions in the markets for their products.

67. While technological solutions to environmental problems are unlikely to be a panacea, improving production processes and product composition can go a long way in reducing and minimizing wastes and pollutants and enhancing efficiency of resource use. The past two decades have witnessed significant headway in the innovation and adoption of environmentally sound technologies. The initial results (mainly end-of-the-pipe technologies retro-fitted to existing plants) reflect the combined effect of public pressure, law-making efforts and subsequent introduction of economic instruments. Air pollution control technologies for fossil fuel consumption by electric utilities and automobiles are good examples of how new ways of production could reduce environmental damages. Similar progress has been made in hazardous-waste control and remediation technologies.

68. The end-of-pipe technologies, useful as they have been in limiting and reducing environmental degradation, have yielded their own pollutants or waste, albeit in lower amounts or of different types. They are often too expensive for small producers to adopt. There is growing recognition that technological innovation should evolve in the direction of better product designs, increased use of secondary materials and reductions in energy and material consumption.

69. An important subject in this area is technological transfer. The need for sharing technological progress arises from both equity concerns and the transboundary nature of global environmental problems, such as global warming and ozone depletion whose solutions call for international cooperation and

collaboration. But there is also a longer-run consideration - the ever-widening technological gap between developed and developing countries. With the enactment of new environmental laws and the consequent adoption of new standards in industrialized countries, developing countries are faced with increasing difficulties in maintaining and enlarging access to global markets. In the short-to-medium terms, technological cooperation, including transfer of clean and other environmentally sound technologies, hold the key to improving technological capacities of many developing economies. The developed countries, which account for 90 per cent of the world market in environmental technologies and products, bear special responsibilities in this respect. Transnational corporations in these countries, both as the principal innovator and repository of environmentally sound technologies, have a unique role to play. 45/

II. REVIEW OF PROGRESS IN IMPLEMENTING THE RECOMMENDATIONS ON CONSUMPTION AND PRODUCTION PATTERNS MADE BY THE COMMISSION AT ITS SECOND SESSION

70. The growing awareness of the long-run implications of changing the prevailing consumption and production patterns has started to generate more momentum for concrete steps by Governments, the business community and major groups. Many of these steps were initiated prior to the consideration of the consumption issue by UNCED. Some others were undertaken in response to the Commission's debate and decision on the subject. Also, many ongoing efforts or planned events by international organizations and representative bodies of major groups have taken into consideration the results of the deliberations by the Commission on reducing unsustainable production and consumption patterns. This chapter provides a short review of the recent experiences of a selected number of countries and organizations in changing unsustainable production and consumption patterns, as provided in their reports to the Commission at its second session.

A. Country experiences

1. Developed countries

71. Among industrialized countries Norway, along with some others, has taken a strong position on reducing unsustainable consumption patterns. Since 1991, the country has levied a consumption tax on CO_2 emissions. This measure helped reduce the CO_2 emissions in Norway by about 5 per cent between 1990 and 1992.

72. In an attempt to involve the business community, the Norwegian Ministry of Environment has initiated a Green Management programme to combine the knowledge of the market and environment so that businesses will avoid environmentally damaging practices and take advantage of the potentials in the "green market". The programme has espoused the life-cycle approach to product management and has emphasized the use of market mechanisms. At present, there are pilot projects in the following sectors - grocery, advertising, construction, and telecommunications. Since 1991, a national consumer-awareness campaign has also been in place, focusing on waste minimization and recycling. Survey results

indicate that already 10 per cent of the population say that they have reduced household waste because of the campaign.

73. In changing unsustainable consumption, Finland has adopted a mix of policy instruments. The Government started with legislation, administrative regulations and permit applications, and recently followed up on these command-and-control actions with economic instruments, including taxes on emissions, product charges (e.g. on fertilizers in proportion to nitrogen and phosphorous concentrations), deposit/refund systems and differentiated taxation (e.g., a discount of US$ 800 from taxation value for cars with catalytic converters).

74. As part of its policy measures on sustainable agriculture, the Ministry of Agriculture and Forestry of Finland has published a guide on good cultivation methods, including those on water protection. Recently, several proposals have been launched to integrate the goals of agricultural production and environmental protection, encompassing decreasing application of chemical inputs, promotion of landscape management and reorganization of subsidies in accordance with environmental criteria.

75. In the United States, a new important initiative launched in 1993 on government acquisition is now being implemented. An Executive Order requires the Environmental Protection Agency to issue guidelines to be followed by federal government agencies in making determinations for the preference and purchase of environmentally preferable products. Since the federal Government is the nation's single largest consumer, purchasing over $200 billion worth of goods and services per year, it is envisaged that the implementation of the Executive Order will harness the federal government's purchasing power to promote markets of products and services that result in less risk to human and ecological health. The federal Government was implementing a number of acquisition measures, including accelerating its purchase of alternative-fuel vehicles, promoting the purchase of recycled and recovered products, and increasing the purchase of energy-efficient products.

2. Developing countries and economies in transition

76. Despite the difficulties arising from limited administrative and other resources, developing countries and economies in transition have adopted measures to change some consumption and production patterns having adverse effects on the environment. India, for example, has recently taken steps to make environmental auditing mandatory as part of the Government's effort to control and reduce environmental risks. Environmental impact assessment has also been made mandatory in specified projects before environmental clearance is obtained. The use of clean technologies is being encouraged through the use of fiscal instruments. On the consumption side, the Government issues awards to consumer products that are environment friendly and that use safer chemicals and technologies.

77. In Malaysia, the Government has recently deployed a mix of instruments to promote sustainable production and consumption patterns. These include price reductions for unleaded fuel, exemption of duty on catalytic converters and

higher import duty on luxury items like large capacity motorcycles. To encourage industries to adopt cleaner manufacturing technology, the Government has provided fiscal incentives, including granting pioneer status to companies that undertake the processing of agricultural and chemical waste. Equipment and materials used for pollution control are exempt from import duty, sales tax and excise duty. Meanwhile, use of these economic instruments has been complemented by public awareness campaigns, launched by governmental agencies and non-governmental organizations. Programmes aimed at schools have proven to be particularly successful.

78. In Estonia, the Government has tried to integrate policy measures aimed at integrating production and consumption patterns into the overall restructuring process. Among other measures, the Government has imposed charges on waste deposition as part of the ongoing effort to minimize waste and encourage innovation in production techniques and methods.

B. Experiences of major groups

79. As is the case with other programme activities of Agenda 21, major groups have either initiated or actively participated in projects and campaigns targeted at unsustainable consumption and production patterns. These groups normally carry out activities that can bring into full play their special expertise and other strengths, including organizational advantages.

80. There exists a wide variety of activities initiated by major groups, but all share a common feature - their advocacy role. By using mass media and other means of communication to disseminate values of sustainable consumption, they address themselves not only to their respective constituencies but also to the public at large. In promoting such values, they also often fulfil a monitoring function, drawing public attention to acts of environmental degradation.

81. For instance, the International Organization of Consumers Unions, along with many others, has for years played such an advocacy-cum-monitoring role. In addition to its efforts at protecting and promoting consumer interests, the organization has recently embarked on a new undertaking - promoting sustainable consumption worldwide. Through conferences, workshops, seminars and publications, it is also targeting its effort at policy makers, pushing for sustainable consumption beyond the year 2000.

82. Many non-governmental organizations have focused their campaigns on specific sectors such as forestry, biodiversity and food consumption. For example, some Dutch non-governmental organizations have worked at the grass-roots level to mobilize support for organic farming by encouraging the purchase of food products produced in an ecologically sound manner. These include meat, vegetables, fruit and tropical beverages. In another case, a couple of local governments and governmental agencies have promised to review their consumption of tropical wood as a result of campaign activities by two organizations.

83. One United States-based non-governmental organization, the Global Action Plan (GAP), seeks to change consumption patterns by working directly with households. Their household-by-household campaign focuses on what can be done

at the household level to reduce adverse environmental impacts in five areas: reducing waste and its toxicity; improving water efficiency; improving household energy efficiency; improving transportation efficiency; and developing an "eco-wise" approach to consumption. GAP is presently operating in 10 countries and has thousands of households participating in its programme. 46/ The participating households in the United States reported that on average they sent 39 per cent less garbage to landfills, used 26 per cent less water, cut 18 per cent of their CO_2 emissions, used 16 per cent less fuel for transportation and achieved an average savings of $403. Right now GAP is working with five pilot cities to refine its strategies for mobilizing community-wide participation. In 1995, GAP will begin replicating en masse the community-based approach, complemented by a national media campaign that promotes the new lifestyle ethic. This effort in turn will be followed by a five-year national campaign with the objective of engaging by the year 2000 a critical mass of Americans - 2 million households in 500 communities - in leading environmentally sustainable lifestyles.

C. Recent developments and experiences in international cooperation

84. As pointed out at the beginning of the present report, the success in changing consumption and production patterns may well determine whether sustainable development can be put into operation and practised. Given its importance and the effect of demand changes on production and a host of other interrelated factors, the subject has been given high attention in other intergovernmental forums and processes. International organizations, both inside and outside the United Nations family, have - to varying degrees - contributed to advancing policy debate and analysis on this subject.

1. Intergovernmental process

85. At the International Conference on Population and Development (Cairo, September 1994), the issue of consumption and production patterns received wide attention. Delegates addressed the interrelationships between demographic factors, poverty, excessive consumption and wasteful production patterns and environmental degradation. The dichotomy between poverty and lack of access to resources, on the one hand, and wasteful and extravagant consumption on the other was highlighted. Many pointed out that the continuation of such a dichotomy could inhibit efforts at sustainable development.

86. The Conference called on Governments to integrate demographic factors into environmental impact assessments and other planning and decision-making processes aimed at sustainable development. Specifically, it was recommended that Governments should modify unsustainable consumption and production patterns through appropriate economic, legislative and administrative measures with a view to fostering sustainable resource use and preventing environmental degradation. Governments were also recommended to utilize demographic data to promote sustainable resource management, especially of ecologically fragile systems, and to undertake research on the linkages between population,

consumption and production, the environment and natural resources, and human health as a guide to effective sustainable development policies.

87. As a follow-up to the 1994 Oslo Symposium on Sustainable Consumption, the Government of Norway hosted the Oslo Roundtable Conference on Sustainable Production and Consumption (6-10 February 1995), with a ministerial session held from 8 to 10 February 1995. The goal of the Conference was to prepare elements for an international work programme and promote progress in sustainable production and consumption patterns by providing a menu of practical recommendations for citizens, non-governmental organizations, business, Governments and international organizations. The report of the Conference proposed a range of specific actions to encourage greater efficiency and equity in the use of energy, land, water, and other resources, and to minimize and avoid pollution and waste. 47/ Particular emphasis was placed on the following:

(a) Building partnerships for sustainable consumption between different sectors of society and reinforcing the values that support sustainable consumption;

(b) Establishing a policy framework for sustainable consumption by moving towards environmentally sound pricing;

(c) Extending producer responsibility for the environmental impacts of goods and services;

(d) Setting a government example in sustainable consumption through environmentally sound public procurement and administration;

(e) Empowering individuals and households to adopt more sustainable consumption patterns.

88. As is evident from the above elements, the Conference focused on an end-use approach to achieving sustainable consumption, which it was felt could have several advantages, such as balancing the traditional supply-side focus of environmental management by complementing it with the demand-side approach; ensuring that environmental problems are not shifted from one part of the life cycle to another; and linking production to consumption. More importantly, such an approach also allows Governments, businesses and consumers to take their share of responsibility. Governments have to provide the framework of incentives, infrastructure, regulation and leadership that will enable other actors to take responsibility for their part of the chain from production to consumption and final disposal. The business sector has a major responsibility for managing the life-cycle environmental impacts of the goods and services they supply. Furthermore, public agencies and business consume large amounts of energy and natural resources and generate corresponding levels of pollution and waste. Consumer decisions are also strongly influenced by - and in turn influence - advertising and other economic and structural mechanisms controlled by business and government. While underlining the growing desire among these actors to move towards sustainable consumption patterns, the documents also warned that getting the world onto a sustainable consumption trajectory would take decades. Current capital stocks of physical infrastructure in housing, energy, transport and waste management may lock societies into unsustainable

patterns of consumption and production over which individual consumers have little influence. Furthermore, cultural habits and value systems may also impede rapid progress in achieving sustainable consumption patterns.

2. Organizations within the United Nations system

89. In response to the Commission's consideration of unsustainable consumption and production patterns, organizations in the United Nations system have undertaken various activities in support of changing consumption and production patterns. These range from sector-specific activities to cross-cutting programmes. For instance, ESCAP, with its cross-sectoral emphasis, is undertaking capacity-building activities in the areas of waste audit and natural resource conservation to promote sustainable production and consumption patterns. Awareness raising through the Asia/Pacific Forum of Environmental Journalists is also assisting in the process.

90. UNESCO is currently addressing the question of changing consumption primarily through its work in the field of education (both formal and non-formal) and public awareness. A major initiative in this regard is the interdisciplinary and inter-agency project on environment and population education and information for human development, launched by UNESCO in the 1994-1995 biennium as a follow-up to the Rio and Cairo Conferences and in anticipation of the World Summit for Social Development. The project is designed to deal with the interwoven issues of population, environment and human development in an integrated manner, with emphasis on context-specific and problem-solving approaches and action.

91. Given its sectoral mandate, the major programme initiative of the United Nations Centre for Human Settlements (HABITAT) focuses on human settlement. The Settlements Infrastructure and Environment Programme, launched by HABITAT as a direct response to Agenda 21, identified as its immediate objective the development of an integrated human settlements approach to the planning, delivery, operation and maintenance of infrastructure and services that would lead to more sustainable production and consumption patterns in water, waste management, energy and transportation. The Programme addresses the waste minimization issue through linking waste-recycling activities to income generation for the urban poor.

92. Another important initiative by HABITAT is the Sustainable Cities Programme, based on concepts and approaches closely related to sustainable consumption and production patterns. The programme is founded on a participatory process at the city level, involving all relevant actors and stakeholders. This process would ensure that effective demand for services are correctly identified and service delivery and policies for land and other resource utilization would be responsive to effective demand.

93. UNCTAD has carried out activities on several topics of direct relevance to changing consumption patterns. These include its work on expanding the utilization, production and trade of environmentally friendly products and on internalizing environmental costs and resource values aimed at full resource pricing. Its work on the former aims to assist developing countries in

increasing export earnings by expanding the sustainable production and export of products that are environmentally preferable from the point of view of both producing and consuming countries.

94. As regards the internalization of environmental externalities related to primary commodities, the fundamental issue of changing consumption and production patterns is on the agenda of the fourth session of the UNCTAD Standing Committee on Commodities which is scheduled to meet from 30 October to 4 November 1995. The discussion will focus on the manner in which prices of natural commodities and their synthetic competitors could reflect environmental costs, taking into account policies relating to the use and management of natural resources and sustainable development. Analytical and empirical work based on case studies undertaken in cooperation with UNEP by UNCTAD centres on the main distortions in price-formation mechanisms, the instruments of internalization and their combination and avenues for a cooperative multilateral approach to internalization.

95. UNCTAD, UNEP, the International Organization for Standardization, and OECD are all undertaking relevant work on eco-labeling issues. These are discussed in the Secretary-General's report on trade, environment and sustainable development (E/CN.17/1995/12).

96. UNDP has recently taken a few initiatives that will have an impact on consumption patterns at the local level. For instance, it has designed an energy strategy for application in the energy programmes funded through UNDP. This strategy will build on four options: more efficient use of energy and energy-intensive material; increased use of renewable sources of energy; more efficient production and use of fossil fuels; and fuel substitution, for high-carbon-based fuels to low-carbon, or no-carbon based fuels.

97. UNDP has started, in collaboration with the World Business Council for Sustainable Development, a public/private partnership initiative aimed at lowering natural resource inputs and minimizing waste. Six pilot projects are currently under way, each addressing a different sector, different resource consumption, and different technological solutions.

98. UNDP's programme to promote sustainable agriculture advocates changes in resource inputs at the farm level. Through a low external input approach to sustainable agriculture, efforts are made to conserve water, topsoil, and limit chemical inputs into the food chain. This process will minimize harmful waste and pollution from the agricultural sector.

99. The National Forest Capacity Programme advocates the development of capacity to manage forests in a sustainable manner. This includes changing present consumption patterns through lower consumption of raw logs, through a system of higher royalties and through addressing needs for changes in concessionary rights. The programme also aims at local capacity-building for more efficient harvesting of timber.

100. FAO is currently engaged in programme activities in several areas that contribute to changing consumption and production patterns. It is actively involved in the promotion of alternatives to fossil fuels, which include biogas

generation, solar cooling and residue-based fuels. Through technical cooperation programmes and projects funded by UNDP, FAO has promoted the use of straw in beef-fattening in China, thereby reducing atmospheric pollution and increasing food security through the production of quality protein.

101. The work of the FAO Forestry Department includes activities relevant to consumption patterns of forest products. FAO is continuing its effort to promote fuelwood-efficient stoves for domestic use in developing countries. It is also promoting biological methods to control forest pests in an attempt to reduce the use of chemicals for such a purpose. In this regard, FAO is a pioneer in supporting the development and implementation of integrated pest management in food and agricultural production. At present, several national, regional and interregional programmes are under way to facilitate the wider dissemination of such management.

102. The United Nations University is carrying out a zero-emissions research initiative. The programme examines options for the redesign of production processes in participating companies, such that the waste by-products of some industries can be used as inputs by other industries.

103. UNEP is carrying out a number of programme initiatives aimed at the adoption of cleaner production world wide and at sustainable consumption of natural resources. The Cleaner Production Programme of the UNEP/PAC's Industry and Environment Programme Activity Centre helps Governments and industry develop the policies necessary for cleaner production and facilitates the transfer of cleaner production technologies. The UNEP Working Group on Sustainable Product Development was recently established. It will encourage and support the development of a world-wide network of centres to promote research and development of sustainable products. Jointly with UNIDO, the UNEP activity centre is currently supporting capacity-building in developing countries through the establishment of national cleaner production centres. These centres, closely associated with industry, will be responsible for raising awareness, collecting and disseminating information, providing technical assistance and conducting demonstration projects.

104. In the area of environmental and natural resource accounting, UNEP, in cooperation with the Statistical Division of the United Nations Secretariat and ECE, convened a workshop in March 1994 on environmental and natural resource accounting, with particular reference to countries in transition to market economies. The workshop focused on the implementation of the revised system of national accounts together with the development of environmental satellite accounts. It provided recommendations on theoretical and methodological advances and modalities of introducing environmental and resource accounting in countries in transition to market economies. Similar activities have also been implemented or planned for other developing countries, including a workshop for Francophone African countries, scheduled for October 1995. In the area of projections and perspective studies, UNEP decided to launch a Global Environment Outlook in early 1995.

105. UNEP's work on the valuation of environmental and natural resources and sustainable development included a consultative expert group meeting on the valuation of environmental and natural resources, held from 8 to 10 August 1994.

The meeting reviewed existing valuation methodologies, identified gaps and proposed practical methodologies, with particular focus on developing countries and economies in transition. UNEP's work on the use of economic instruments for environmental management was advanced by a consultative expert group meeting held from 10 to 12 August 1994. That meeting reviewed the use and practical application of economic instruments for environmental management and sustainable development, with special reference to developing countries and economies in transition. Particular emphasis was given to the application of these instruments in sectors like terrestrial ecosystems, including soils, wildlife, biodiversity, freshwater resources, oceans and marine ecosystems and toxic chemicals and hazardous wastes. In collaboration with other organizations, UNEP also launched a number of projects on the application of economic instruments in developing countries, in Brazil, China, the Republic of Korea and six other countries in Latin America and the Caribbean.

3. Organizations outside the United Nations system

106. The international organization outside the United Nations system that has established close working relations with the Commission is OECD. Recently, the member countries asked the Organization to undertake a work programme to analyse key concepts related to consumption and production patterns, to assess relevant trends and examine policy options and tools. In implementing the work programme, OECD will serve as a focal point for communication among its 25 member countries; it will also seek to ensure that the work takes into account the interests and activities of non-member countries.

107. At present, OECD is focusing its work on four main areas. The first one concerns the clarification of the concepts involved, with the aim of creating a common reference framework for discussion and analysis. The second area is problem identification and analysis, including selecting and analysing trends in consumption and their economic, social and environment impacts. The third area is assessing policy options, including the mix of the various instruments and tools that can be used to achieve particular goals. The fourth area is monitoring and evaluation, including through the use of country environmental performance reviews.

III. CONCLUSIONS AND PROPOSALS FOR ACTION

A. Summary of findings and conclusions

108. Past trends and current projections suggest that developing countries have been slowly catching up in the consumption of the main categories of materials and are expected to continue to do so in the coming few decades. But in per capita terms, significant gaps between developing and developed countries will remain. These gaps can be narrowed more rapidly only by implementing effective economic development strategies which address the other critical elements of economic and social sustainability identified in Agenda 21.

109. Regarding energy and raw materials usage, considerable progress has been made, especially in developed countries, in reducing the intensity of energy use

and of metals and minerals per unit of GDP. However, problems relating to excessive fertilizer and pesticide and soil quality in the agricultural sector have only just begun to be addressed. Deforestation continues to be unsustainably high.

110. Environmental monitoring data and other relevant information, including consumer information, which are currently lacking in many developing countries, need to be developed urgently so as to provide a sound information base for policy formulation and decision-making on changing the current unsustainable production and consumption patterns. National Governments as well as the United Nations development agencies and international aid organizations should give immediate priority to meeting this need. Developed countries should take the lead in compiling consumer information, since its lack has been commonly identified as a serious constraint on changing consumption habits and lifestyles. Active participation by manufacturers and consumer organizations in this endeavour should be secured.

111. Country experiences show that several types of instruments have been used to change unsustainable production and consumption patterns. Governments mostly start with command-and-control measures, laying down an effective legal framework specifying the responsibilities and obligations as well as the rights of the different groups of the society. In the long run, economic and other market-based instruments seem to be the preferred choice, since they serve as highly effective instruments for the internalization of externalities, generate revenues and promote greater efficiency in achieving environmental objectives. Social instruments, especially education and awareness campaigns, have played a unique and indispensable role in galvanizing society into action and in maintaining momentum for such action. Increasingly, Governments themselves may engage in education and awareness campaigns, as they seek to incorporate environmental education into national curricula and as government agencies try to change their consumption patterns through new procurement policies. Country experiences have shown that results are greatest when a mix of these instruments is employed in light of specific national and local conditions.

112. The present report's short review of technology transfer and eco-labeling has underlined some international dimensions of changing production and consumption patterns. This points to need for greater international cooperation in harmonizing criteria for the setting of voluntary product standards and for the transfer of technology which are dealt with in the context of the Commission's discussions on international trade and the transfer of technology.

113. The report's preliminary analysis based on the integrated life-cycle approach to resource usage has demonstrated the wide scope and multiplicity of the issues related to changing consumption and production patterns. It underscores the need for continuing the traditional emphasis on the supply side, while complementing it with strengthened efforts focused on the demand side. The increasing emphasis on consumers also reflects the conviction that changing consumption habits and lifestyles will eventually persuade manufacturers to develop new products and new production processes. A number of problems call for further and more in-depth discussion, including agreement on an appropriate conceptual and methodological framework for a more systematic and standardized study of consumption and production issues; the need for building or improving

infrastructure which will facilitate a shift to more sustainable consumption and production patterns by households and other end-users; how Governments and major groups could in their own way most effectively contribute to progress in changing consumption patterns, in addition to participating in "green" consumer movements. These and other questions highlight the need for a work programme of the Commission whose main elements are outlined below.

B. Possible work programme of the Commission on sustainable consumption and production patterns

114. The Commission might consider a multi-year work programme on changing consumption and production patterns having four broad headings:

(a) Identifying the policy implications of projected trends in consumption and production patterns;

(b) Assessing the impact on developing countries, especially the least developed and small-island developing countries, of changes in consumption and production patterns in developed countries;

(c) Evaluating the effectiveness of policy measures intended to change consumption and production patterns such as command-and-control, economic and social instruments, and governmental procurement policies and guidelines;

(d) Eliciting time-bound voluntary commitments from countries to make measurable progress on those sustainable development goals having especially high priority at the national level.

115. The Commission should consider the periodic preparation of reports containing long-term projections of the world economy with a time horizon of up to 40 years. Such reports should, inter alia, build upon the work of the Department of Economic and Social Information and Policy Analysis, on the Global Input/Output Model of the World Economy (World Model), and on the reports it prepares for the General Assembly on the overall socio-economic perspective of the world economy and in the relevant reports of UNEP and UNU. These studies would make use of global models designed to project a number of indicators of environmental stress and their impacts on the environment and on human health. The compilation of resource balance sheets in selected resource using industries would provide useful inputs. Suitable modelling frameworks should be capable of shedding light not only on issues related to the global commons but also on the differences in the relative importance of various sustainable development issues among world regions having different economic and social characteristics.

116. Changes in consumption and production patterns in developed countries can be expected to have a variety of impacts on developing countries. Most of these impacts will be transmitted by the international trading system as markets for some products shrink and others increase. Other impacts would be associated with the activities of transnational corporations as major vehicles for transmitting technology to developing countries. Still other impacts could arise from imitative behaviour of consumers in developing countries as "green consumerism" becomes more fashionable in developed countries. The impact of

eco-labeling schemes on consumption and production patterns in developed countries is of growing importance and in need of systematic analysis. Studies on some of these issues would be prepared in a cooperative effort by many of the international organizations where work is planned or already under way.

117. The Commission may also wish to encourage Governments to support a programme which is under consideration by UNCTAD and UNEP for implementation in collaboration with other relevant governmental and non-governmental organizations. The programme would prepare an initial set of general guidelines and principles on the internalization of environmental externalities for traded commodities in their raw and processed forms; assess the applicability of this set of general principles for specific raw and processed commodities under concrete economic, financial, legal (national and international) and social conditions in selected countries where specific environmental problems or services (positive or negative externalities) associated with these products would be identified; and propose, in the light of this assessment, economic, legal, financial and institutional arrangements which will facilitate the implementation of internalization policies and measures.

118. The Commission may wish to recommend that the Guidelines for Consumer Protection be expanded to contain guidelines for sustainable consumption patterns, including criteria for national eco-labeling schemes based on work under way by the International Organization for Standardization, UNEP and UNCTAD. Regarding the effectiveness of various types of policy instruments , used singly and in combination, the Commission might consider ways to facilitate a sharing of country experiences. It is especially important to be able to measure the impact of both economic and social instruments on the environmental objectives as well as to measure their indirect effects on the economy. To this end, the Republic of Korea is planning to organize in the second half of 1995 a workshop on economic instruments with special reference to the experience of Asian countries. At a later stage more systematic review of country experiences might be organized by the Commission in collaboration with the regional commissions.

119. The Commission may wish to draw the attention of United Nations Member States, United Nations agencies and other international organizations, and non-governmental observers of the Commission to the report on the Oslo Ministerial Roundtable Conference on Sustainable Production and Consumption. 47/ The report was issued in the form of a summary by the Chairperson, Mr. Thorbjorn Bernsten, Norwegian Minister of Environment. It contains a menu of action-oriented recommendations directed towards civil society, labour, business, local governmental authorities, national Governments and international organizations. It organizes these recommendations under three broad categories: improving understanding and analysis; applying tools for modifying behaviour; and monitoring, evaluating and reviewing performance. Special emphasis is placed on energy, transport and the design of cities. The Commission may wish to recommend that the various stakeholders mentioned above use the report as the basis for discussion in suitable forums and, subsequently, report to the Commission on the implementation of those recommendations considered most appropriate, in time for consideration at its fifth session, in 1997.

Notes

1/ Report of the United Nations Conference on Environment and Development, Rio de Janeiro, 3-14 June 1992, vol. I, Resolutions Adopted by the Conference (United Nations publication, Sales No. E.93.I.8 and corrigenda), resolution 1, annex II.

2/ See E/1994/33.

3/ Environmental Trends (Washington, D.C., Council on Environmental Quality, 1989).

4/ Since the estimates are from two different sources, some caution is required in comparing the two sets of data.

5/ Renewable and alternative sources of energy, such as wind and solar energies, are not discussed here, since they represent those sources of energy that are environmentally sound and sustainable. In addition, the Commission at the current session will consider the outcome of the recent special session of the Committee on New and Renewable Sources of Energy and on Energy for Development, which addresses the development and use of renewable and alternative sources of energy in rural areas.

6/ Mostafa K. Tolba and Osama A. El-Kholy, The World Environment, 1972-1992 (London, Chapman and Hall, 1992), p. 374.

7/ For more detailed information, see World Resources 1994-95 (Washington, D.C., World Resources Institute, 1994), pp. 7-8.

8/ Tolba and El-Kholy, op. cit.

9/ World Economic and Social Survey, 1994 (United Nations publication, Sales No. E.94.II.C.1).

10/ The historical pattern of industrialization suggests that the initial period of industrialization is energy intensive, requiring rising fossil fuel consumption. As the industrialization advances, energy demand starts to fall. At the advanced stage, improvements in technology and production processes as well as shifts to information-based production and to service lead to declines in energy consumption per unit of value produced, giving rise to an inverted "U" shape for energy/GNP ratio in the development process. If this pattern is to be repeated in developing countries, rapid increases in energy demand in the developing world seems to be unavoidable.

11/ Monitoring Environmental Progress (Washington, D.C., World Bank, forthcoming), p. 17.

12/ Tolba and El-Kholy, op. cit., pp. 410 and 424.

13/ Monitoring Environmental Progress ..., pp. 13-14.

14/ Ibid. UNCTAD's volume based calculations which have steel, aluminum and copper as the three metals with dominating statistical weight suggest that developing countries accounted for 7 per cent of industrialized countries' metal consumption in 1970 and some 15 per cent in 1988, excluding the former Eastern block countries.

15/ Eduardo Borensztein and others, "The behavior of non-oil commodity prices", International Monetary Fund Occasional Paper No. 112 (Washington, D.C., August 1994), p. 12.

16/ "Agriculture: towards 2010" (C 93/24), p. 64.

17/ Tolba and El-Kholy, op. cit., pp. 292-296.

18/ "Agriculture: towards 2010" ..., pp. 138-141; Tolba and El-Kholy, loc. cit., pp. 292-296.

19/ Ibid.

20/ See Larry Karp and others, "Internalization of environmental damages in the agriculture: effects on environmental and economic variables" (UNCTAD/COM/Misc.67), 19 January 1995, p. 46.

21/ Tolba and El-Kholy, op. cit., p. 168.

22/ "Agriculture: towards 2010" ..., pp. 162-164.

23/ See Brough, "A New Lay of the Land", as quoted in Gunnar Kohlin, "Sustainability, deforestation and policy implications for Africa", in Economic Policies for Sustainable Development, Thomas Sterner, ed. (Dordrecht, Kluwer Academic Publishers, 1994), p. 199.

24/ Official Records of the Economic and Social Council, 1994, Supplement No. 15 (E/1994/33), para. 50.

25/ OECD Economic Studies, No. 19 (Winter 1992).

26/ National Environmental Policy Plan Plus (The Hague, Ministry of Housing, Spatial Planning and the Environment, 1990), pp. 23-43; Towards a Sustainable Netherlands (The Hague, Ministry of Housing, Spatial Planning and the Environment, 1994), pp. 22-28.

27/ EIA is defined as "an activity designed to identify and predict the impact of an action on the biogeophysical environment and mankind's health and well-being, and to interpret and communicate information about the impacts" quoted in Tolba and El-Kholy, op. cit., p. 635.

28/ Environmental Quality (Washington, D.C., the Council on Environmental Quality, 1990), pp. 202-203.

29/ For a detailed discussion of full cost pricing of resources and the closely related issue of internalization of externalities, see "The internalization of environmental costs and resource values: a conceptual study" (UNCTAD/COM/27), 10 June 1994. Also see "The effect of the internalization of external costs on sustainable development" (TD/B/40 (2)/6, 7 February 1994).

30/ These definitions are based on "The internalization of environmental costs ...", annex 1 of which contains a short analysis of the respective merits and inadequacies of these valuation techniques.

31/ For a detailed discussion of methodologies and issues related to environmental resource accounting, see Integrated Environmental and Economic Accounting, Handbook of National Accounting, Series F, No. 61 (United Nations publication, Sales No. E.93.XVII.12).

32/ E/CN.17/1995/18.

33/ Resolution 39/248, annex.

34/ A recent workshop hosted by the Government of the Netherlands on facilities for a sustainable household came up with findings that identify lack of consumer information as a serious bottleneck in several areas of sustainable household consumption, including energy and water consumption, product choice, waste and lifestyles. Lack of adequate feed-back on results of changed consumption patterns also impedes further progress. See "Facilities for a sustainable household", report of a workshop held at Zeist, the Netherlands, 23-25 January 1995.

35/ The Workshop was held in Geneva, 28-29 June 1994. TD/B/WG.6/Misc.2.

36/ For a detailed discussion on policy failure and the environment, see "The internalization of environmental costs ...".

37/ For detailed case studies in OECD countries, see Integrating Environment and Economics: The Role of Economic Instruments (Paris, OECD, forthcoming).

38/ See E/CN.17/1995/8 for further discussion.

39/ Environmental Quality ...

40/ Example used in "The effect of the internalization of external costs on sustainable development" (TD/B/40 (2)/6), 7 February 1994, p. 30, note No. 38.

41/ Integrating Environment and Economics ...

42/ TD/B/40 (2)/6, p. 31, note No. 48.

43/ Ibid., pp. 13-15.

44/ This is so because firms can be assumed to be cost-minimizers. Because of this essential behavioural feature, a well-defined market of tradable permits could allocate control responsibility cost-effectively despite incomplete information on the control possibilities by the regulatory authorities. See Tom Tietenberg, "Market-based mechanisms for controlling pollution: lessons from the United States", in Economic Policies for Sustainable Development, Thomas Sterner, ed.

45/ For detailed discussions on transnational corporations' role in this field, see Environmentally Sound Technologies: Options for Developing Countries (Geneva, UNCTAD, forthcoming).

46/ In the Netherlands, Global Action Plan has adopted an "Eco-team programme", organizing households to voluntarily reduce waste and save energy and water. Initial results indicate that there is great potential for expanding such programmes since participating households are not only contributing to environmental protection and better quality of life but also achieving savings in monetary terms. The experience also points to the need for support from local authorities, such as refunding unused sanitation charges to households, so that concrete benefits can accrue to both households and local governments.

47/ For a more detailed discussion of these elements, see "Elements for an international work programme on sustainable production and consumption", a report of the Oslo Ministerial Roundtable Conference on Sustainable Production and Consumption, 6-10 February 1995.